Computer navigation in total hip replacement: a meta-analysis
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CRD summary
The review concluded that computer navigation decreased the number of acetabular cups implanted outside the desired range of alignment in total hip replacement. The reliability of the conclusion is unclear given the potential for reviewer error and bias, the small number of included trials with small sample sizes, reporting errors, and incomplete reporting of the review methods.

Authors' objectives
To determine if computer navigation improves the precision of acetabular cup placement in hip arthroplasty.

Searching
MEDLINE (1966 to March 2007), EMBASE (1980 to 2007), Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL), United Kingdom National Research Register and ClinicalTrials.gov were searched. Search terms were reported. Bibliographies of selected articles were handsearched.

Study selection
Randomised controlled trials (RCTs, published or unpublished) that evaluated the use of computer navigation compared with the freehand technique for placing the acetabular component in patients undergoing total hip replacement were eligible for inclusion. Trials had to report the number of outliers of acetabular cups outside the desired alignment range as the outcome measure.

In the included trials, the comparisons evaluated were freehand technique versus computed tomography (CT) based navigation or an imageless system. Post-operative acetabular position was measured using CT scans or radiographs. All acetabular components were of the press-fit type. The mean age of included patients ranged from 61 to 64.7 years; their mean body mass index ranged from 25.2 to 28.5kg/m$^2$.

Two authors independently assessed studies for inclusion. The authors did not state how any disagreements in study selection were resolved.

Assessment of study quality
Methodological quality was evaluated by assessing the adequacy of randomisation (sequence generation), blinding of outcome assessors, follow-up rates, comparability of co-interventions between groups, and use of intention-to-treat analysis.

The authors did not state how many reviewers assessed study quality.

Data extraction
Two authors extracted data to calculate odds ratios (ORs) and 95% confidence interval (CIs) for the categorical outcome of acetabular alignment within the desired range.

The authors did not state how any disagreements in data extraction were resolved.

Methods of synthesis
Pooled odds ratios and 95% confidence intervals were calculated using fixed-effects (Mantel-Haenszel) meta-analysis. Statistical heterogeneity was assessed but methods used were not reported. Publication bias was assessed using funnel plots.

Results of the review
Three RCTs were included in the review; reported sample sizes were inconsistent (n=250 patients in the text; n=220 in the meta-analysis/tables).

The quality of all included trials was reported as satisfactory. One trial reported adequate allocation sequence generation. One trial reported appropriate allocation sequence concealment. Blinding of outcome assessors was undertaken in all trials. Co-interventions were comparable in all trials. Two trials reported a follow-up rate of 100%. Two trials reported use of intention-to-treat analysis. No evidence of publication bias and heterogeneity were found.

The number of acetabular outliers in the navigation group was 10.7% (15 out of 140 patients) compared with 41.8% (46 out of 110 patients) in the freehand group (OR 0.285, 95% CI 0.143 to 0.569; n=220 patients).

Authors' conclusions
Computer navigation in hip arthroplasty improved the precision of acetabular cup placement by decreasing the number of outliers from the desired alignment.

CRD commentary
The review question and inclusion criteria were clear. Relevant databases were searched. Attempts were made to search for unpublished studies. Appropriate steps were taken to minimise reviewer bias and error in study selection and data extraction, but was not reported for validity assessment.

Quality assessment appeared to have been performed using appropriate criteria. Trial results appear to have been pooled using appropriate methods, but reported results (text versus meta-analysis) were inconsistent, so it was difficult to confirm their reliability. Statistical heterogeneity was assessed, but the methods used were incompletely reported. The authors acknowledged a number of limitations including differences in the interventions, and a small number of trials with small sample sizes.

The reliability of the authors' conclusion is unclear given the potential for reviewer error and bias in the review methods, small number of included trials with small sample sizes, reporting errors, and incomplete reporting of review methods.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that further well-designed RCTs are needed to evaluate the effect of computer navigation on both clinical and radiographic outcomes, complications and survival rates, quality of life years gained and cost outcomes.

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